



$$\text{Pose} \rightarrow \left[\underbrace{x, y, z}_{\text{Translation}}, \underbrace{q_x, q_y, q_z, q_w}_{\text{Orientation}} \right]$$

Homogeneous Transformation Matrix

$$T = \begin{bmatrix} R_{3 \times 3} & t_{3 \times 1} \\ 0_{1 \times 3} & 1_{1 \times 1} \end{bmatrix}$$

To convert pose information to transformation matrix

1. Convert quaternion information to Rotation Matrix

$T_W^C \rightarrow$ Transformation matrix
of the Camer in World
Coordinates

$T_W^S \rightarrow$ Transformation matrix
of the Satellite in

$$T_C^S = T_C^W T_W^S$$

$$T_C^W = (T_W^C)^{-1} \Rightarrow \text{inverse homogenous} \\ \text{Transformation} \\ \text{matrix}$$

Inverse Homogenous Transformation

$$T^{-1} = \begin{bmatrix} R^T & \vdots & -R^T P \\ \vdots & \ddots & \vdots \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix}$$